SHORT RESUME/ SYNOPSIS OF PH. D TOPIC

Entitled

"APPLICATIONS, ECOLOGY AND DIVERSITY OF MAYFLIES FROM WESTERN MAHARASHTRA"

Submitted to

THE FACULTY OF SCIENCE AND TECHNOLOGY,
SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,
NANDED – 431 606 (M.S.) INDIA.

For the Degree of
Doctor of Philosophy in Zoology

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MAY – 2019

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ABSTRACT OF PROPOSED WORK PLAN/ PROBLEM

1. Introduction:

The Mayflies belongs to the order Ephemeroptera which is relatively small order of insects containing described over 3000 species worldwide and classified in 42 families and over 400 genera (Sartori, 2008). Mayflies are very good indicators of conservation importance and of centers of endemicity, and they can be used to identify significant localities at much smaller scale than those identified by studies on vertebrates. Mayflies play a very crucial role in ecological cycles. They are visualized as a potential food source for fishes and other aquatic organisms. Mayflies are ancient and oldest winged insects. From Maharashtra including Western Ghats no such studies are reported earlier. Therefore, present study is designed with the ecology and diversity of mayflies. Due to climate change, recently outbreak of mayflies has been expensed in Kolhapur district by blocking the road ways at night. Therefore, ecological studies related to ecological parameter, occurrence, seasonal abundance and role in ecological cycles will be studied. Morphological diversity of mayflies will be studied and checklist of the mayflies will be made.

2. Review of Literature and Development in the subject (Previous work done in the relevant area**):**

The review of the literature indicates that distribution and biology of Mayflies have been studied from Western Ghats by Sivramkrishnan *et al*., (2009). Balasubramanian and Anbalagan (2004) worked on relationship of oxygen consumption to substrate particle size in *Ephemera nadinae*. Dinkaran and Anbalagan (2007) studied diversity, trophic relationships and biomonitoring potential of Ephemeroptera, Plecoptera and Tricoptera communities in streams of southern Eastern Ghats. Jana *et al.,* (2008) studied the diversity and community structure of aquatic insects in a pond in Midnapore, West Bengal, India. Dinkaran *et al.,* (2009) reported a new species of *Choropterpes* from a tropical stream of south India. Selva Kumar (2012) worked on diversity and distribution of mayflies in Tamirabarani River of Southern Western Ghats, India.

The review of the literature also indicates that Dudgon (1999) studied parthenogenesis in mayflies from Hong Kong. Subramhaniam and Sivaramkrishan(2010) reported check list of Ephemeroptera of India. They also described several new species of

mayflies from India. Perez and Segnini (2010) studied seasonal variation of mayflies in tropical Andean headwater stream. Dubey *et al.,* (2013) studied the insect diversity of river Kunda Khargone district of Madhya Pradesh including mayflies. Dutta and Malholtra (1986) studied seasonal variation of mayflies from Jammu. Elliot and Humpsech (1983) provided a key to the adults of British Ephemeroptera. Malhotra *et al.,* (1996) studied ecology of macroinvertibrate from a fish pond including mayflies. Wolda and Flowers (1985) studied seasonality and diversity of mayfly adults from tropical environment. Helen *et al.,* (2008) studied global diversity of mayflies in freshwater and several other workers worked on diversity and ecology of mayflies from different parts of the world.

Very recently Kamble and Sathe (2015) studied the diversity and economic importance of mayflies (Ephemeroptera) from Kolhapur region, India. Similarly, Sathe and Kamble (2016) studied the biology and morphology of nymphs of *Indialis badia* (Ephemeroptera: Leptophelebiidae). Kamble and Sathe (2017) also studied the predator diversity of mayflies from Kolhapur district, India. Kamble *et.al*., (2019) studied physico-chemical water parameter of Bhogavati River, Kolhapur, India.

Applications, ecology and diversity of mayflies is neglected from Maharashtra. Hence, the present work is selected.

3. Objectives of Research:-

To study the mayflies with respect to,

- i) Morphological diversity at species level.
- ii) Seasonal variation at species level.
- iii) Interrelationship of physicochemical parameters like Dissolved oxygen, Free Co_2, pH, Temperature, Hardness, Biological oxygen demand, Total alkalinity and rainfall with reference to mayflies.
- iv) Identification of food for fishes in the form of mayflies
- v) Statistical data analysis of ecological parameters by standard deviation.
- vi) Sex ratio and predators of mayflies.

Hypothesis of Study:

Ecology and diversity of mayflies will be suggesting the appropriate utilization of species as food for fishes, birds and other vertebrates.

4. Methodology to be adopted:

The mayflies will be collected from river and other relevant water bodies of Western Maharashtra specially Kolhapur, Sangli and Satara districts at 15 days interval by one man one hour search method. The mayflies nymphs and adults will be collected with the help of aquatic

insect net and reared in glass cages for further study in laboratory. Collected material will be preserved in the laboratory for morphological studies.

a) Methods of research

Biodiversity, seasonal abundance and distribution of mayflies will be studied by visiting the study areas in 15 days intervals by one man one hour search method for collection of mayflies.

b) Sampling design

May flies will be collected with help of aquatic insect net and preserved in insect preservative. Later, slides will be prepared for morphological studies. Sampling will be made at 15 days interval.

c) Research design

May flies will be collected throughout the year from aquatic ecosystems especially rivers and freshwater bodies and preserved in alcohol and slides will be made for morphological description. Morphological diversity will be studied with the help of compound microscope by consulting appropriate literature cited under references.

Identification of food for fishes in the form of mayflies will be studied under laboratory condition by providing various mayflies to different Pisces in aquarium and other predator observed by spot observation.

d) Methods of data collection

i) Journals

ii) Internet information

iii) Field Visits.

e) Methods of data Analysis:

Standard deviation.

Study Area:- River and other relevant water bodies of Western Maharashtra specially Kolhapur, Sangli and Satara districts of Maharashtra State, India.

5. Importance of Study:

- **International Status-**

Globally 3000 species of mayflies are scattered in to 400 genera and 42 families (Barber James et al., 2008). Out of these, 390 species in 84 genera and 20 families occur in the Oriental region. About 49% of the genera (41 genera) are endemic to the region (Barber James et al. 2008). They are major component of food webs, forming a link between primary production and secondary consumers such as fish (T. Rathinakumar *et al.,* 2014). They live

only 1-2 hours to 14 days (Elliott and Humpesch, 1983). They are important fish food item in all of their life stages (nymphs, subimagos and imagos) (Dubey *et al.,* 2013).

- **National Status-**

Worldwide 3000 species occur whereas from India 124 species are known, Sivaramakrishna *et al.* (2009). A perusal of literature reveals that 19 species of 15 genera under 10 families are reported from Maharashtra State (Sharma and Chandra, 2012). From Maharashtra including Western Ghats no such studies are reported earlier. Therefore, present study is designed with the applications, ecology and diversity of mayflies.

- **Significance of the study-**

Mayflies are amphibiotic insects and represents order Ephemeropters which inhabit both lotic and lentic ecosystem of waters (Srivastava, 1991). Mayflies play a critical role in aquatic ecosystem and provide an important food source for fishes, birds and other vertebrates. Mayflies have important role in ecology of freshwater streams especially in ecocycles and food webs. Mayflies are excellent indicators of ecosystem of health and water pollution. A greater part of Mayflies life cycle is spent as larvae in water and short period as terrestrial adult for reproduction. They are major component of food webs, forming a link between primary producer and secondary consumers (Rathinakumar *et al.,* 2014).

For fulfillment of nutritional requirement of human being resources are to be identified on large scale. Fisheries are one of the large scale resources for human diet and mayflies are very important food for fishes. The study of the mayflies will add great relevance for the development of requirement of nutrition to the study. Hence, applications, ecology and biodiversity of mayflies have been selected for present study.

6. Proposed work Plan/ Formulation and Structure of Study:

The proposed work will consist of following chapters,

1. General introduction: For importance of the work, national and international status of the topic.
2. The chapter second will be devoted to review of literature of the work.
3. The chapter third will be related to materials and methods adopted in completion of the work.
4. The chapter fourth will contain morphological diversity of Mayflies and finally key characters of the new species or remarks on each species will be given. At last check list will be provided.
5. The chapter fifth will contain physico-chemical parameters of different rivers.
6. The chapter sixth will contain statistical data analysis.
7. The chapter seventh will contain bibliography.

Year- Wise Plan of Work and Targets to be Achieved:-

FIRST YEAR:

i. Reference Work.
ii. Collection of Mayflies.
iii. Morphological Study.
iv. Distribution, Occurrence, Seasonal Abundance, Sex Ratio, Predatory Record.

SECOND YEAR:

All work mentioned under first year.

i. Seasonal Abundance.
ii. Photograph of Insects.
iii. Preparation of Research papers.
iv. Ecological Parameter Study

THIRD YEAR:

i. Statistical Data Analysis
ii. Writing of Thesis.
iii. Submission of Thesis.

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